CLAIMS

The following is claimed:

1. A method for determining latency for real-time transport protocol data flows, comprising the steps of:

communicating between a first endpoint and a second endpoint; and

measuring latency for a data flow between said first endpoint and said second endpoint.

2. The method of claim 1, wherein said first endpoint and said second endpoint are multi-media routers.

3. The method of claim 1, wherein said step of measuring latency is characterized by a test data packet being used to perform said communication, and wherein said measuring latency step further comprises the steps of:

said first endpoint transmitting said test data packet to said second endpoint;

said second endpoint looping said test data packet back to said first endpoint;

comparing when said test data packet was received by said first endpoint to when said test data packet was sent to said second endpoint, thereby determining a round trip time; and

determining said latency based upon said round trip time.

4. The method of claim 1, wherein said step of measuring latency is performed by using a real-time control protocol (RTCP), said measuring latency step further comprising the steps of:

said first endpoint transmitting a send report to said second endpoint comprising a timestamp representing the time said first endpoint transmitted said send report;

extracting said timestamp from said send report and adding said timestamp to a receive report that is transmitted from said second endpoint to said first endpoint, wherein said receive report also comprises an estimate of how long it took after said first endpoint sent said send report, for said first endpoint to receive said receive report from said second endpoint; and

dividing said estimate in two, resulting in said latency.

5. A method for determining jitter for real-time transport protocol (RTP) data flows, comprising the steps of:

beginning a timer when a first data packet of an RTP data flow is received by a first endpoint;

stopping said timer when a second data packet of said RTP data flow is received by said first endpoint; and

adding measured time from said beginning of said timer to said stopping of said timer to an aggregate to obtain said jitter for said RTP data flow.

6. The method of claim 5, wherein said timer is located within said first endpoint.

7. The method of claim 5, wherein said steps of beginning said timer, stopping said timer, and adding said measured time are periodically repeated to obtain an average jitter value.

8. A method for determining lost packets for real-time transport protocol (RTP) data flows, comprising the steps of:

determining a sequence number of a received RTP data packet within said RTP data flow;

storing said determined sequence number;

calculating whether said determined sequence number sequentially falls within a predetermined numerical order; and

if said sequence number of said received RTP data packet does not sequentially fall within said numerical order, storing said sequence number as a missed RTP data packet.

9. The method of claim 8, further comprising the step of tracking how many RTP data packets have been marked as missing.

10. The method of claim 8, wherein said step of determining said sequence number of said received RTP data packet within said RTP data flow is performed upon receipt of said RTP data packet.

11. The method of claim 10, wherein said RTP data packet is received at a first endpoint.

12. The method of claim 11, wherein said first endpoint is a multi-media router.

13. The method of claim 8, wherein said step of storing said sequence number as a missed RTP data packet is not performed until a specified amount of time has passed, during which time said RTP data packet having said sequence number may be received, thereby preventing storage of said sequence number as a missed RTP data packet.

14. A system for determining latency for real-time transport protocol data flows, comprising:

means for communicating between a first end point and a second endpoint; and

means for measuring latency for a data flow between said first endpoint and said second endpoint.

15. The system of claim 14, wherein said first endpoint and said second endpoint are multi-media routers.

16. The system of claim 14, wherein said means for measuring latency uses a test data packet to perform communication between said first endpoint and said second endpoint, and wherein said means for measuring latency further comprises:

means for transmitting said test data packet from said first endpoint to said second endpoint;

means for looping said test data packet back to said first endpoint;

means for comparing when said test data packet was received by said first endpoint to when said test data packet was sent to said second endpoint, to determining a round trip time; and

means for determining said latency based upon said round trip time.

17. The system of claim 14, wherein said means for measuring latency uses a real-time control protocol (RTCP), said means for measuring latency further comprising:

means for transmitting a send report from said first endpoint to said second endpoint, wherein said send report comprises a timestamp representing the time said means for transmitting transmitted said send report;

means for extracting said timestamp from said send report and adding said timestamp to a receive report that is transmitted from said second endpoint to said first endpoint, wherein said receive report also comprises an estimate of how long it took after said first endpoint sent said send report, for said first endpoint to receive said receive report from said second endpoint; and

means for dividing said estimate in two, resulting in said latency.

18. A system for determining jitter for real-time transport protocol (RTP) data flows, comprising:

means for beginning a timer when a first data packet of an RTP data flow is received by a first endpoint;

means for stopping said timer when a second data packet of said RTP data flow is received by said first endpoint; and

means for adding measured time from said beginning of said timer to said stopping of said timer to an aggregate, to obtain said jitter for said RTP data flow.

19. The system of claim 18, wherein said timer is located within said first endpoint.

20. A system for determining lost packets for real-time transport protocol (RTP) data flows, comprising:

means for determining a sequence number of a received RTP data packet within said RTP data flow;

means for storing said determined sequence number;

means for calculating whether said determined sequence number sequentially falls within a predetermined numerical order; and

means for storing said sequence number as a missed RTP data packet if said sequence number of said received RTP data packet does not sequentially fall within said numerical order.

21. The system of claim 20, further comprising means for tracking how many RTP data packets have been marked as missing.

22. The system of claim 20, wherein said means for determining said sequence number of said received RTP data packet within said RTP data flow performs said determination upon receipt of said RTP data packet.

23. The system of claim 22, wherein said RTP data packet is received at a first endpoint.

24. The system of claim 23, wherein said first endpoint is a multi-media router.

25. The system of claim 20, wherein said means for storing said sequence number as a missed RTP data packet does not store said sequence number until a specified amount of time has passed, during which time said RTP data packet having said sequence number may be received, thereby preventing storage of said sequence number as a missed RTP data packet.

26. A system for determining latency for real-time transport protocol data flows, comprising:

a first endpoint, connected to a second endpoint, wherein said first endpoint comprises;

a transceiver;

software stored within said first endpoint defining functions to be performed by said first endpoint; and

a processor configured by said software to perform the step of,

measuring latency for a data flow from said first endpoint to said second endpoint.

27. The system of claim 26, wherein said first endpoint and said second endpoint are multi-media routers.

28. The system of claim 26, wherein said step of measuring latency is characterized by a test data packet being used to perform said communication, and wherein said measuring latency step further comprises the steps of:

said first endpoint transmitting said test data packet to said second endpoint;

said second endpoint looping said test data packet back to said first endpoint;

comparing when said test data packet was received by said first endpoint to when said test data packet was sent to said second endpoint, thereby determining a round trip time; and

determining said latency based upon said round trip time.

29. The system of claim 26, wherein said step of measuring latency is performed by using a real-time control protocol (RTCP), said measuring latency step further comprising the steps of:

said first endpoint transmitting a send report to said second endpoint comprising a timestamp representing the time said first endpoint transmitted said send report;

receiving a receive report from said second endpoint comprising, said timestamp added to an estimate of how long it took after said first endpoint sent said send report, for said first endpoint to receive said receive report from said second endpoint; and

dividing said estimate in two, resulting in said latency.

30. A system for determining jitter for real-time transport protocol (RTP) data flows, comprising:

a first endpoint, connected to a second endpoint, wherein said first endpoint comprises;

a transceiver;

software stored within said first endpoint defining functions to be performed by said first endpoint; and

a processor configured by said software to perform the steps of,

beginning a timer when a first data packet of an RTP data flow is received by said first endpoint,

stopping said timer when a second data packet of said RTP data flow is received by said first endpoint, and

adding measured time from said beginning of said timer to said stopping of said timer to an aggregate to obtain said jitter for said RTP data flow.

31. The system of claim 30, wherein said timer is located within said first endpoint.

32. The system of claim 30, wherein said steps of beginning said timer, stopping said timer, and adding said measured time are periodically repeated to obtain an average jitter value.

33. A system for determining lost packets for real-time transport protocol (RTP) data flows, comprising:

a first endpoint, connected to a second endpoint, wherein said first endpoint comprises;

a transceiver;

software stored within said first endpoint defining functions to be performed by said first endpoint; and

a processor configured by said software to perform the steps of,

determining a sequence number of a received RTP data packet within said RTP data flow,

storing said determined sequence number,

calculating whether said determined sequence number sequentially falls within a predetermined numerical order, and

if said sequence number of said received RTP data packet does not sequentially fall within said numerical order, storing said sequence number as a missed RTP data packet.

34. The system of claim 33, wherein said processor is further configured to perform the step of tracking how many RTP data packets have been marked as missing.

35. The system of claim 33, wherein said step of determining said sequence number of said received RTP data packet within said RTP data flow is performed upon receipt of said RTP data packet.

36. The system of claim 35, wherein said RTP data packet is received at said first endpoint.

37. The system of claim 36, wherein said first endpoint is a multi-media router.

38. The system of claim 33, wherein said step of storing said sequence number as a missed RTP data packet is not performed until a specified amount of time has passed, during which time said RTP data packet having said sequence number may be received, thereby preventing storage of said sequence number as a missed RTP data packet.

39. The system of claim 33, wherein said processor is further configured to perform the step of counting the number of said missed RTP data packets.

40. A system for determining flow quality statistics for real-time transport protocol (RTP) data flows, comprising:

a first endpoint, connected to a second endpoint, wherein said first endpoint comprises;

a transceiver;

software stored within said first endpoint defining functions to be performed by said first endpoint; and

a processor configured by said software to perform the steps of,

determining latency for said RTP data flows,

determining jitter for said RTP data flows, and

determining lost packets for said RTP data flows.